



## SEEPAGE COLLECTION FOR THE CROSS-OVER TEST BETWEEN ALCOVE 8 AND NICHE 3

PROCEDURE ID: YMP-LBNL-TIP/AFT-14.0

Rev.0, Mod.1.

EFFECTIVE 8/24/01

### 1. PURPOSE

This Technical Implementing Procedure (TIP) has been prepared to ensure that seepage (flow of liquid water into an underground opening) in Niche 3 is collected following liquid release in Alcove 8, and that the data from these tests are generated, in a well-documented and repeatable fashion that conforms to and is appropriate for the needs of scientific investigators and the Lawrence Berkeley National Laboratory (LBNL) Yucca Mountain Site Characterization Project (YMP) quality assurance requirements.

This procedure describes the process by which seepage will be collected. It describes what equipment shall be used and how this equipment shall be managed and utilized to obtain the measurements. This TIP describes what data shall be collected and how it shall be recorded during testing. It also describes how to determine whether the data acquired is acceptable or not acceptable and how a record of this acceptability shall be kept.

### 2. SCOPE

This procedure applies to all LBNL personnel (or contractor personnel following LBNL procedures) who conduct crossover tests between Alcove 8 and Niche 3. This activity is subject to the U.S. Department of Energy (DOE) Quality Assurance Requirements and Description (QARD), DOE/RW-0333P. Prior to conducting work described in Section 3.0 of this procedure, personnel require training to this procedure.

For all technical activities, data collected using this procedure and any equipment calibrations or recalibrations that may be required shall be in accordance with this TIP and in full compliance with Office of Civilian Radioactive Waste Management (OCRWM) Administrative Procedure (AP)-12.1Q, *Control of Measuring and Test Equipment and Calibration Standards*. Electronic data maintenance, controls and transfers shall comply with YMP-LBNL-Quality Implementing Procedure (QIP)-SV.0, *Management of YMP-LBNL Electronic Data*.

Documentation resulting from actions taken under this TIP will be recorded in

scientific notebooks as described in the AP-SIII.1Q, *Scientific Notebooks*.

If this procedure cannot be implemented as written, YMP-LBNL personnel shall notify the responsible Principal Investigator (PI) or designee. If it is determined that a portion of the work cannot be accomplished as described in this TIP, or would produce undesirable results, that portion of the work shall be stopped and not resumed until this procedure is modified per YMP-LBNL-QIP-5.2, *Preparing Quality and Technical Implementing Procedures*.

If the responsible PI or designee determines that a modification or a revision to the TIP would cause an unreasonable delay in proceeding with the task, then an expedited change to the procedure, including documentation of deviation from the approved procedure, can be made according to YMP-LBNL-QIP-5.2. Such changes are subject to review, usually after the task has proceeded, and thus work performed under TIPs with expedited changes is done at risk of future invalidation.

Staff members may use a controlled electronic or hard copy of this procedure; however, employees are responsible for assuring that the correct revision of this procedure is used. When this procedure becomes obsolete or superseded, it shall be destroyed or marked "superseded" to ensure that this document is not used to perform work.

### **3. PROCEDURE**

#### **3.1 System Components**

The Niche 3 seepage collection program uses a Seepage Collection System and a Data Acquisition System. The collection system may typically consist of a set of containers assigned to specific locations in and around the niche, each of which is equipped with pressure transducers to measure and record the depth of water accumulated.

##### **3.1.1 Seepage Collection System**

The Seepage Collection System consists of all plumbing, solenoid valves, etc. that are used to regulate and control the collection of fluids. The Seepage Collection System is used to measure the rate at which liquids are collected in Niche 3. The physical layout of the Seepage Collection System to be used shall be described in the scientific notebook (see Section 3.4.2 E).

If a tracer has been included in the injection liquid stream, liquid samples shall be collected for analysis as specified in section 3.5..

### 3.1.2 Data Acquisition System

The Data Acquisition System consists of all a digital multimeter, sensors, acquisition hardware, software, and wiring that interfaces to the Seepage Collection System.

The Data Acquisition System shall control test equipment and log test parameters. The system measures seepage rates of liquids by setting control voltages and currents and records the output of pressure transducers. Software to run the Data Acquisition System shall be controlled according to the requirements of AP-SI.1Q, *Software Management*.

## 3.2 Test Preparation

Staff members preparing to deploy the collection system shall perform the actions described below.

### 3.2.1 Pre-test Checks

- A. Before turning on the electronics for testing, verify that all cabling is safe without frayed or nicked electrical cords and that all equipment is properly secured such that no hazards will exist when it is energized.
- B. Verify that no unsecured fluid lines exist. Verify that both air and water are being supplied to the Seepage Collection System.
- C. Turn on the uninterruptable power supply before turning on other system components.
- D. Verify that re-calibration is not due before anticipated end of test.

## 3.3 Calibration Requirements

### 3.3.1 Calibration Interval

The Setra Pressure Transducers and Digital Multimeters are the two

components requiring calibration. The Setra Pressure Transducers and Digital Multimeters are calibrated by an outside vendor procured from YMP approved contractors on the Qualified Suppliers List (QSL) on a yearly calibration cycle. Verify that their calibration is still valid before collecting data. If they are not within current calibration or the data they are generating are suspect, they shall be removed from service and replaced with calibrated units. The units requiring calibration shall be treated as per the requirements of AP-12.1Q.

### 3.3.2 System Component Accuracy

The system component accuracy specified below provides for reasonable bounds on measured and controlled parameters. Frequently the measuring equipment is manufactured and recalibrated to higher accuracy than is required and practical to maintain in the harsh conditions encountered underground. The accuracy standards mentioned below only refer to qualified measurements. Diagnostic measurements are sometimes made to ensure minimal acceptable bounds for some parameters, such as tunnel air or water pressure, which does not affect the acquisition of the qualified measurements.

Qualified pressure measurements are required to be taken at an accuracy of  $\pm 1\%$  of the full-scale range of the Setra Pressure Transducers. Qualified digital multimeter measurements are required to be taken at an accuracy of  $\pm 0.5\%$  of the full-scale range.

Any deviations from these required accuracy standards shall be followed by an impact analysis, to see if the acquired data are still useable. This analysis shall be documented and cross-referenced to the data collected in the scientific notebook. Any equipment found to be out of calibration shall follow the procedure discussed in Section 3.8.

## 3.4 Data Collection

- 3.4.1 The electronic log shall record all electronically monitored parameters (voltage measurements from pressure transducers, humidity probes and barometric probes along with time of

measurement). Seepage collection data shall include flow rates for liquid injection and flow rate for liquid recovery. Each data point shall have a corresponding time stamp.

#### 3.4.2 Notebook Records

Staff members shall record the following information in their scientific notebook used for testing in accordance with AP-SIII.1Q, and include:

- A. Personnel present and name of associated data files.
- B. Start time of each test.
- C. Any calibrations or performance checks carried out to prepare or maintain the equipment used.
- D. Location of collection units in relationship to a fixed reference point.
- E. Schematic diagram of experimental equipment layout including serial numbers of any qualified M&TE or reference to where it can be found.
- F. Name of software, version number used to run measuring and test equipment (M&TE). Required documentation of software must comply with AP-SI.1Q.
- G. Any unusual occurrences, equipment malfunction or testing interferences from activities in other boreholes or locations in the tunnel.
- H. Reference to this TIP by number, revision and modification.

### 3.5 Water Samples for Analysis

Water samples that require chemical analysis may be from various sources, including (but not limited to) seepage samples that contain tracers.

#### A. Sample Name/Bottle Labeling

Samples shall be collected in the appropriate clean containers (e.g.,

high-density polyethylene bottles with tight sealing caps) deemed suitable for collection and storage of samples. Care shall be taken (e.g., wear gloves) to prevent cross-contamination during sample collection. Each sample shall be given a unique identifier to reflect the sample source or an appropriate abbreviation thereof. Sample names shall be marked with an indelible marker either directly on the bottle or on an adhesive sticker affixed to the bottle along with the name of the originator and the date. The sample name, time and location of sample collection, collection method, and the unique identifier assigned by the YMP Sample Management Facility (SMF) (applicable if the sample is collected in the field site in accordance with YAP-SII.1Q *Submittal, Review, and Approval of Requests for Yucca Mountain Site Characterization Project Geologic Specimens*) shall be entered into the scientific notebook.

#### B. Sample Handling/Preservation

Following sample collection, samples shall be refrigerated whenever possible for later delivery to LBNL (or other analytical laboratory) for analysis. For samples collected at field sites, refrigeration after sample collection and during sample transfer to LBNL may not be feasible. At the discretion of the responsible PI or designee, alternative steps (e.g., putting the ice packs together with the samples during sample storage and transfer) shall be taken to mitigate the potential sample degradation. The method of preservation shall be recorded in the scientific notebook.

The samples shall be analyzed within three months after collection. If samples cannot be analyzed within this timeframe, they shall be analyzed at the first available opportunity, and a notation shall be placed in the scientific notebook identifying the duration the samples have exceeded the analysis timeframe (obtained from sample collection date recorded on the collection bottle, and the analysis date). A notation shall also be placed on the analysis results allowing special consideration to be given to data generated, and an analysis of the data applicability. This analysis shall be documented in the scientific notebook.

#### C. Sample Transfer

Samples shall be transferred to LBNL (or other analytical laboratory) along with a Chain-of-Custody Record (Attachment 1) containing the

sample identification, time of collection, and analyses required. A copy of the Chain-of-Custody Record shall be placed in the scientific notebook, and a copy shall be left with the samples. Signatures of the person delivering the samples and the person receiving the samples, and the time and date of transfer shall be placed on the chain-of-custody form.

### **3.6 Data Storage and Backup**

The data generated from crossover tests are stored on the hard disk of the data acquisition system PC. The data shall be backed up after data collection has concluded and the backup shall be verified by comparing the sizes of the original and duplicate data files and by opening and visually spot-checking a few copied data points. This process shall be documented in the scientific notebook.

The data shall be reviewed before submittal to the Technical Data Management System (TDMS) to verify that the seepage collection rates have been properly recorded. Any variation outside of expected equipment accuracy and repeatability shall be investigated and the data shall be evaluated as to whether they are to be considered acceptable. The impact of any unusual occurrences, equipment malfunctions or testing interferences as noted under Sections 3.4.2.C and 3.4.2.D shall be evaluated before submittal of data to the TDMS. These evaluations shall be documented in the scientific notebook in compliance with requirements of YMP-LBNL-QIP-SV.0.

### **3.7 Usage of M&TE**

Staff Member shall document each usage of the equipment in the scientific notebook (containing the same information as described in AP-12.1Q) or the M&TE Standard Usage Log as described in AP-12.1Q.

### **3.8 Control of Out-of-Calibration Conditions**

If any out-of-calibration conditions (as described in AP-12.1Q) are determined to exist for the M&TE item (e.g., instrument produces results known to be in error), the instrument shall have an out-of-service tag applied indicating that it is not to be used and, when possible, the instrument shall be moved to a segregated "out-of-service" area.

The above conditions shall be documented by using the M&TE Out of

Calibration Report (OCR) in accordance with the instructions provided in AP-12.1Q. If it is determined that the data is impacted, a Nonconformance Report (NCR) shall be initiated in accordance with AP-15.2Q, *Control of Nonconformances*.

## **4. RECORDS**

### **4.1 Lifetime**

Records generated as a result of this TIP are entries in:

- Scientific notebooks or attachments to such notebooks,
- Equipment Logbooks (including M&TE Standard Usage Log, if applicable).
- M&TE Out of Calibration Reports, if applicable

The data generated by following this procedure shall be turned over to the Technical Data Coordinator for submittal to the YMP TDMS. in accordance with AP-SIII.3Q, *Submittal and Incorporation of Data to the Technical Data Management System*.

### **4.2 Non-Permanent**

None.

### **4.3 Controlled Documents**

None.

### **4.4 Records Center Documents**

Records associated with this procedure shall be submitted to Records Coordinator for transmittal to the Records Processing Center (RPC) in accordance with AP-17.1Q, *Record Source Responsibility for Inclusionary Records*.

## **5. RESPONSIBILITIES**



- 5.1** The **Principal Investigator (PI)** is responsible for assuring full compliance with this procedure and providing training thereof.
- 5.2** **Staff Members** involved in this activity are responsible for following this procedure and turning over related documentation to the Records Coordinator for submittal to the RPC in accordance with AP-17.1Q. Related data shall be turned over to the Technical Data Coordinator for submittal to the YMP TDMS in accordance with AP-SIII.3Q.

Special qualifications and/or training unique to the conduct of this procedure are as follows: In the acquisition phase of the project, field supervisors and/or managers (or their designates) shall have a working knowledge of mechanical and electronic equipment. Field personnel shall have all safety training as required by LBNL Environmental Health and Safety regulations to operate basic electrical and low pressure compressed gas systems, as well as to be in compliance with Exploratory Studies Facility (ESF) General Underground Safety Training requirements.

## **6. ACRONYMS AND DEFINITIONS**

### **6.1 Acronyms**

AP	OCRWM Administrative Procedure
DOE	U. S. Department of Energy
ESF	Exploratory Studies Facility
LBNL	Lawrence Berkeley National Laboratory
M&TE	Measuring and Test Equipment
NCR	Nonconformance Report
QARD	Quality Assurance Requirements and Description
QIP	YMP-LBNL Quality Implementing Procedure
QSL	Qualified Suppliers List
OCRWM	Office of Civilian Radioactive Waste Management

OCR	Out of Calibration Report
PI	Principal Investigator
RPC	Records Processing Center
SMF	Sample Management Facility
TDMS	Technical Data Management System
TIP	YMP-LBNL Technical Implementing Procedure
YAP	YMP Administrative Procedure
YMP	Yucca Mountain Site Characterization Project

## 6.2 Definitions

**Calibration:** Comparison of a measurement standard or instrument of known accuracy with another standard or instrument to detect, correlate, report, or eliminate by adjustment, any variation in the accuracy of the instrument or equipment being compared.

**Staff Member:** Any scientist, engineer, research or technical associate, technician, or student research assistant performing quality-affecting work for YMP-LBNL.

**Technical Implementing Procedure:** Each TIP describes YMP-LBNL technical tasks that (1) are repetitive, (2) are standardized, and (3) can return different results if deviation from the sequence of steps occur.

## 7. REFERENCES

AP-12.1Q, *Control of Measuring and Test Equipment and Calibration Standards*

AP-15.2Q, *Control of Nonconformances*

AP-17.1Q, *Record Source Responsibility for Inclusionary Records*

AP-SI.1, *Software Management*

AP-SIII.1Q, *Scientific Notebooks*

AP-SIII.3Q, *Submittal and Incorporation of Data to the Technical Data Management System*

DOE/RW-0333P, *Quality Assurance Requirements and Description (QARD)*

YAP-SII.1Q, *Submittal, Review, and Approval of Requests for Yucca Mountain Site Characterization Project Geologic Specimens*

YMP-LBNL-QIP-5.2, *Preparing Quality and Technical Implementing Procedures*

YMP-LBNL-QIP-SV.0, *Management of YMP-LBNL Electronic Data*

## **8. ATTACHMENTS**

Attachment 1: Chain-of-Custody Record

## **9. REVISION HISTORY**

08/28/00      Revision 0, Modification 0:

                This is the initial issue of this procedure.

08/24/01      Revision 0, Modification 1

                This revision added Section 3.5, Water Samples, updated references to current procedures, and added a chain-of custody form.

**10. APPROVALS**

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Date

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Technical Reviewer: Peter Persoff

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Technical Reviewer/PI: Joseph Wang

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EA Reviewer: Nancy Aden-Gleason

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Date

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OQA Concurrence: Stephen D. Harris

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Date

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Project Manager: Gudmundur S. Bodvarsson

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Date

CHAIN OF CUSTODY RECORD

YMP Activity:					<b>Chain-of-Custody Record</b>					Chain-of-Custody Number:										
Send Results to:					MS:					<b>ANALYSES</b>					Date Results Required		Remarks (i.e., Sample Condition, Presence of Headspace), Instructions, and/or Special Requests			
Telephone:					Fax:															
Sampler Name(s):										Type and Number of Containers										
Sample Number	Date	Time	Sample Matrix	Preservative																
Relinquished by: (signature)		Date/Time		Received by: (signature)			Relinquished by: (signature)			Date/Time		Received by: (signature)								
Relinquished by: (signature)		Date/Time		Received by: (signature)			Relinquished by: (signature)			Date/Time		Received by: (signature)								
Relinquished by: (signature)		Date/Time		Received for Lab by: (signature)			Date/Time		Laboratory: Attention:											